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(21) International Application Number: PCT/US95/09529 (22) International Filing Date: 14 July 1995 (14.07.95) (30) Priority Data: 08/324,763 17 October 1994 (17.10.94) US (71) Applicant: INTEL CORPORATION [US/US]; 2200 Mission College Boulevard, Santa Clara, CA 95052 (US). (72) Inventors: MYERS, Alan, M.; 28686 S.W. Strawberry Hill Drive, Hillsboro, OR 97123 (US). CHARVAT, Peter, K.; 301 S.W. Lincoln, Portland, OR 97201 (US). LETSON, Thomas, A.; 15895 S.W. Bobwhite Circle, Beaverton, OR 97007 (US). YANG, Shi-ning; 16800 N.W. Waterford Way, Portland, OR 97229 (US). BAI, Peng; 18746 S.W. Frank Court, Aloha, OR 97007 (US). (74) Agents: TAYLOR, Edwin, H. et al.; Blakely, Sokoloff, Taylor & Zafman, 7th floor, 12400 Wilshire Boulevard, Los Angeles, CA 90025-1026 (US).		(81) Designated States: AM, AT, AT (Utility model), AU, BB, BG, BR, BY, CA, CH, CN, CZ, CZ (Utility model), DE, DE (Utility model), DK, DK (Utility model), EE, ES, FI, FI (Utility model), GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SK (Utility model), TJ, TM, TT, UA, UG, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG). Published <i>With international search report.</i>
(54) Title: A NOVEL VIA HOLE PROFILE AND METHOD OF FABRICATION		
<p>The diagram shows a cross-section of a semiconductor device. At the top, a layer labeled 200 is shown. Below it is a layer labeled 208. A central via connection (212) extends downwards from a top layer (210) into an underlying interconnection line (202). The via connection (212) has a top layer (210) and a bottom layer (214). The interconnection line (202) is surrounded by a layer (216). The entire structure is on a substrate (206). Other layers are labeled 222, 224, 226, 228, and 204.</p>		
(57) Abstract <p>A novel high performance and reliable interconnection structure for preventing via delamination. The interconnection structure of the present invention comprises a via connection (212) which extends into and undercuts an underlying interconnection line (202) to lock the via connection (212) into the interconnection line (202).</p>		

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IN THE CLAIMS

I claim:

1. An interconnection structure for an integrated circuit comprising:
 - an interconnection; and
 - a via connection wherein said via connection extends into said interconnection and undercuts said interconnection.
2. The interconnection structure of claim 1 wherein said interconnection comprises an aluminum alloy layer.
3. The interconnection structure of claim 1 wherein said interconnection further comprises a conductor comprising a refractory metal.
4. The interconnection structure of claim 3 wherein said via connection undercuts said conductor comprising a refractory metal.
5. The interconnection structure of claim 1 wherein said interconnection comprises a titanium-aluminide layer formed on an aluminum-alloy layer and wherein said via connection undercuts said titanium aluminide layer of said interconnection.
6. An interconnection structure for an integrated circuit formed on a semiconductor substrate comprising:
 - a first conductive layer comprising aluminum above said substrate;
 - a second conductive layer comprising a refractory metal layer on said first conductive layer;
 - an insulating layer above said second conductive layer; and
 - a via connection said via connection having a first portion extending through said second conductive layer and a second portion

INTERNATIONAL SEARCH REPORTInternational application No.
PCT/US95/09529

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	IBM Technical Disclosure Bulletin, Volume 38, No. 6, June 1995 "Method of Anchoring Contact or Via Plugs by Producing Lateral Recess in ILD or IMD Films"	1, 3, 4, 16, 25-27
A	Hasegawa et al, Japan Society of Applied Physics, 52nd Fall Meeting, Extended Abstracts, p. 718, October, 1991., "Via Filling on Al Films by Selective CVD W Using Al Isotropic Etching",	1-30
A	Gardner et al, IEEE Transactions on Electron Devices, Volume ED-34, No. 3, pp 632-643, March 1987, "Interconnection and Electromigration Scaling Theory" .	1-30
A	Gardner et al, IEDM 84, pp 114-117, 1984, "Layered and Homogeneous Films of Aluminum and Aluminum/Silicon with Titanium, Zirconium, and Tungsten for Multilevel Interconnects".	1-30

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H01L 21/302

US CL : 437/192, 194, 195, 246, 947, 981; 257/774

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 437/192, 194, 195, 947, 981, 246; 257/773, 774, 775, 923; 148/dig. 161

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A, 5,312,775 (FUJII ET AL) 17 MAY 1994	1-30
A,P	US,A, 5,408,130 (WOO ET AL) 18 APRIL 1995	1-30
A	US,A, 5,106,461 (VOLFSON ET AL) 21 APRIL 1992	1-30
A	US,A, 4,879,257 (PATRICK) 07 NOVEMBER 1989	1-30
A	US,A, 4,507,852 (KARULKAR) 02 APRIL 1985	1-30
A	US,A, 4,714,686 (SANDER ET AL) 22 DECEMBER 1987	1-30
A	JP,A, 02,122,546 (OZASA) 10 MAY 1990	1-30
A	JP,A, 63,133,647 (HARUTA) 06 JUNE 1988	1-30

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reasons (as specified)	"Z" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

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